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Impact Of Sediment Contamination On Fish And Fisherfolks In Olugbobiri And Ogboinbiri Creek, Bayelsa State, Nigeria

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Abstract: ***The study of sediment contamination on fish and fisherfolks in Olugbobiri and Ogboinbiri creek was assessed to relate the contamination due artisanal refining in Olugbobiri and pipeline vandalization in Ogboinbiri creek. Sediment samples were collected with Ekman dredger (grab), from five sample stations, each in the creeks & stored in thick aluminum foil, kept in hand cooler surrounded by ice block to moderate surrounding temperature before laboratory analysis. Air dried samples were digested with Eqularegia (mixture of HCL, HNO3, and H2O, ratio of 3:1:10) and metal analyzed using Atomic Absorption spectrophotometry for TPH AND PAH, Hexane was used for extraction and analyzed by gas chromatography (API, 1994). Mean concentration between dry and raining season showed value of TPH as 344.99 and 34.63, PAH as 0,829 and 0.039 in Olugbobiri and Ogboinbiri creek respectively. Heavy metal concentration was of the order;***

Iron> zinc> copper> Nickel> lead>Cadmium>Vanadium in Ogboinbiri and in Olugbobiri creek it was of the order iron> zinc> copper> lead> Nickel> cadmium>vanadium. Sediment characteristic was of the order sand> clay>silt in both creeks, Analysis of variance showed that, cadmium, lead, iron and sediment characteristics have significant difference at p< 0.001 while nickel showed significant difference at p<0.005 in season, no significant difference in station in any of the sediment parameters, but all concentrations were above international standard (WHO 2004).

Regression analysis was showed that co-efficient of determination in all fish species were weak and has negative allometric growth rate in both creeks while fish species cost analysis revealed that cost of fish species were higher in Ogboinbiri creek than Olugbobiri creek, indicating that Ogboinbiri fisher folk earn higher income than olugbobiri fish folks. This is attributed to the degree and frequency of generation of pollutants that sink to contaminate sediment quality, the fish habitat.

Keywords: Sediment Contamination, olugbobiri creek, Ogboinbiri Creek,

I. INTRODUCTION

Olugbobiri and Ogboinbiri oil fields are major oil fields in southern Ijaw local government area, operated by Agip oil company. The people of these areas are mainly fisher folks and farmers whose ends are never met, due to pollution occasioned by artisanal refining and pipeline vandalization **.**Since the inception of Agip into the area, no memorandum of understanding has ever been met hence youth's agitation for survival, induced activities of Artisanal refining and pipeline vandalization where heavy metal drop out of solution to contaminate sediment quality, Twumasi (2006) Adubuisi (2007), Kadata, (2012).

Metal which occur naturally in the earth crust are released to the soil and the hydrologic cycle during physical and chemical weathering of igneous and metamorphic rocks. The background concentrations of these elements are mainly controlled by the geologic characteristic of the water shed, the essential trace (heavy) metal at low concentration are micro-nutrients and as such are essential to life but become toxic at

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high concentrations. Previous result recorded by osuji (2004) Nduka (2009), Elijah (216) and seiyaboh (2017, showed significant difference when compared with WHO (2007). Waste dumps have also contributed partly to the presence of metals in the sediments of the two creeks.

The work therefore assessed the comparative impact of sediment contamination on fish and fisher folk in Olugbobiri and Ogboinbiri creeks as a major concern.

OBJECTIVE OF THE STUDY

The specific objective of the study included were

- ✓ To investigate the contamination in sediment in Olugbobiri and Ogboinbiri creeks.
- ✓ To asses the impact on fish and fisher folk in Olugbobiri and Ogboinbiri creeks.
- ✓ To compare result with international standard and make recommendations.

II. MATERIALS AND METHODS

STUDY SITE

The study was done on the Olugbobiri and Ogboinbiri creeks. The creeks are tidal in nature washed down by water flowing from river num river. Located on the southern part of the distributary shown (FIG.I). the creeks have inputs of product of artisanal refining and pipeline vandalization couplied with indiscriminate waste dumps. Five sample stations were established in Olugbobiri as well in Ogboinbiri creek. The sampling stations and their co-ordinates are.

Ogboinbiri Coordinates Lat $4^0$78’28’N Log $5^0$93’48’E, Lat $4^0$78’69’N Log $5^0$94’85’E, Lat $4^0$79’37’N Log $5^0$95’55’E, Lat $4^0$80’90’N Log $5^0$95’82’E, Lat $4^0$83’08’N Log $5^0$97’59’E

Olugbobiri Coordinates Lat $4^0$54’81’N Log $5^0$91’06’E, $4^0$58’44’N $5^0$92’31’E, $4^0$61’51’N $5^0$93’89’E, $4^0$62’41’N $5^0$95’78’E, $4^0$64’93’N $5^0$98’59’E

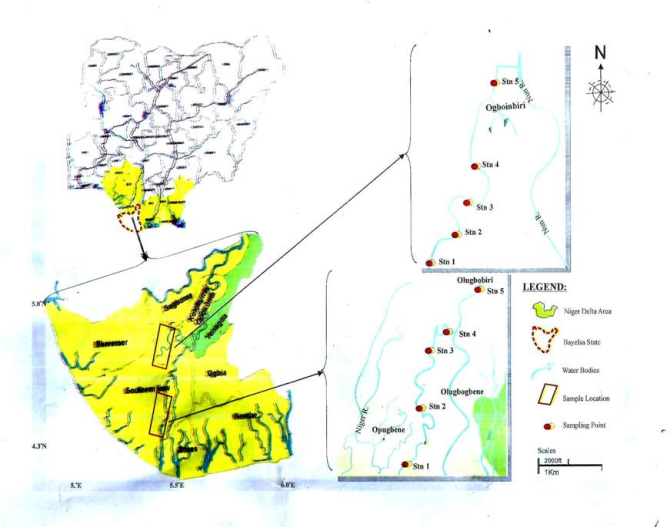

Figure 1: Map of study Area Showing Sampling Sites in Olugbobiri and Ogboinbiri Creeks

SEDIMENT SAMPLING

Sediment samples were collected from the five sample stations each in Olugbobiri and Ogboinbiri creek with a Ekman dredger (grab), and stored in a thick aluminum foil and kept in a hand cooler surrounded with ice block to moderate the surrounding temperature before laboratory analysis.

FISH SAMPLING

Fishing canoe with sein net (type of fishing net) in proximity to an artisanal refining water front was chosen as sample station in Olugbobiri creek and one fishing canoe with sein net in close distance to a recently vandalized pipeline was chosen as sample stations in Ogboinbiri creek. Five such sample stations were chosen in olugbobiri and ogboinbiri creek respectively. Fishes caught and identified. Were measured and weighed with, one hundred centimeter capacity tape and with 0.1 – 1kg capacity Ohau’s giant hand scale and recorded. Each sample station is 1km apart from the next.

SEDIMENT SAMPLE ANALYSIS

Heavy Metals: Sediment samples were dried, 5g of dried sediment was collected and sieved, 2mm mesh size sieved sample was weighed and digested in a 1:3:10 ml ratio of nitric acid, hydrochloric acid and distilled water, 5ml of extracted solvent was analyzed for heavy metal including Zinc (Zn), Copper (Cn), Lead (Pb), Cadmium (Cd), Iron (Fe), Nickel (Ni) and Vanadium (V), using GBC Avanta 6600 AAS which has been calibrated using working solution of 0.5, 1.0, 2.0, 5.0, 10.0 and 100.0 mg/l solution prepared from 1000 mg/l stock solution for total petroleum hydrocarbon (TPH) and Polyaromatic hydrocarbon (PAH), Hexane was used for the extraction, 10 ml of extract was passed and analyzed by gas chromatography (API. 1994)

STATICAL ANALYSIS OF RESULTS

Data obtained was presented with the aid of statistical tables, and graphs using micro soft excel for heavy metals and was analyzed with Minitab R14 for two- way analysis of variance (ANOVA) to show significant difference in station and season at $p<0.001$ or $p<0.005$ as the case may be.

For the fish data analysis, excel was applied to plot regression graph to show the relationship between length and weight this also showed the cost difference between fish species during the study period.

III. RESULTS AND DISCUSION

The results, in (table 1) showed that hydrocarbon and heavy metals concentration of sediment in Olugbobiri and Ogboinbiri creek are all above international standard. Except the element cadmium concentration in Ogboinbiri dry season that measured 0.001 mg/kg. The mean concentration between wet and dry season in TPH was 344.99 in Olugbobiri and 34.631 in Ogboinbiri.The PAH measured 0.829mg/kg and 0.039, respectively, Heavy metal Concentration was of the

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order; Iron>zinc>Copper>Lead>Nickel>Cadmiun>Vanadium, in Olugbobiri creek while in ogboinbiri creek heavy metals concentration was of the order iron>zinc>Copper>Nickel>lead>Cadmium>Vanadium.

		WET SEASON		DRY SEASON		
	HYDROCARBONS AND HEAVY METALS	MEAN CONCENTRATION OGBOIN KG/L	MEAN CONCENTRATION OLUGBO KG/L	MEAN CONCENTRATION OGBOIN KG/L	MEAN CONCENTRATION OLUGBO KG/L	W H O PERMISABLE CONCENTRATON LIMIT KG/L
	TPH	30.03	408.958	39.232	281.023	0.03
	PAH	0.069	0.947	0.009	0.711	0.007
1	Zinc, Zn	11.534	18.358	17.468	20.732	0.05
2	Copper, Cu	8.038	9.84	4.998	5.944	0.10
3	Cadmium, Cd	0.69	0.66	<0.001	0.220	0.003
4	Lead, Pb	7.132	8.438	0.314	2.716	0.01
5	Nickel, Ni	7.928	7.158	5.336	5.512	0.05
6	Vanadium, V	0.444	0.454	0.364	0.378	0.01
7	Iron, Fe	6,069.00	6,062.092	7266.1	7647.92	0.30
8	Sand %	61.512	68.104	81.712	82.92	-
9	Silt %	15.992	13.976	6.376	6.84	-
10	Clay %	22.496	17.92	11.312	10.232	-
11	Texture Class	Sandy	Sandy	Sandy	Sandy	-

Table 1: Comparison of mean, hydrocarbon and heavy metal and permissable level of sediment in wet/dry season of ogoin and olugbo

Sediment characteristic-was of the order Sand> clay> silt in both creeds.

Analysis of variance in table 4.2 showed that cadmium, lead. Iron and sediment characteristic have significant difference at p< 0.001 while nickel showed a significant difference at p<0.005 in season. There were no significant difference in station in any of the sediment parameters. Similar results were obtained by osuji (2004), Nduka (2009), Arimoro (2011) and Elijah (2016)

SEDIMENTANOVATABLE

Parameter	Station		Season		Interaction	
	F	P-VALUE	F	P-VALUE	F	P-VALUE
TPH	4.12	0.0059	0.15	0.703	0.20	0.660
PAH	1.58	0.227	2.04	0.173	1.58	0.227
ZINC	2.29	0.150	1.55	0.231	0.28	0.601
COPPER	1.50	0.228	9.59	0.007	0.15	0701
CADMIUM	0.39	0.539	56.27	<0.001	1.00	0.333
LEAD	1.40	0.253	48.69	<0.001	0.04	0.851
NICKEL	0.22	0.645	11.42	<0.005	0.57	0.460
VANADIUM	0.05	0.823	2.30	0.149	0.001	0.965
IRON	0.62	0.441	34.38	<0.001	0.67	0.425
SAND	2.23	0.150	55.79	<0.001	1.57	0.228
SILT	0.31	0.582	36.70	<0.001	0.80	0.383
CLAY	2.40	0.141	26.68	<0.001	0.92	0.353

Table 2: Summary of Two-Way Analysisi of Variance (ANOVA) of Sediment Quality Variables, Significant differences are Highlighted.

FISH SPECIES		PRESENT		ANTON 2004	IKOMI 2005	EZEKIEL 2011	AJIBOYE 2011	JULIIUS 2014
		OGBOIN	OLUGBO					
HETEROBRANCHUS	R	0.034	0.058	0.23	0.03	0.33	0.16	0.47
	B	0.006	0.005	0.08	0.18	0.23	0.33	0.21
CITHARINUS	R	0.270	0.036	0.12	0.06	0.05	0.13	0.52
	B	0.134	0.007	0.46	0.17	0.16	0.05	0.12
GYMNACHUS	R	0.070	0.254	0.24	0.06	0.15	0.47	0.78
	B	0.006	0.009	0.21	0.07	0.14	0.15	0.34
SCHILBE	R	0.279	0.018	0.12	0.08	1.90	0.17	0.11
	B	0.016	0.004	0.45	0.14	0.12	1.90	0.51
SYNODONTIS	R	0.028	0.000	0.24	0.06	0.15	0.12	0.48
	B	0.006	0.050	0.08	0.23	0.02	0.15	1.90
ALESTES	R	0.043	0.071	0.34	0.05	0.04	0.15	0.34
	B	0.015	0.008	0.27	0.12	0.11	0.04	1.20
CLARIAS	R	0.005	0.001	0.21	0.70	1.70	1.2	1.80
	B	0.003	0.001	0.34	0.24	0.04	1.7	0.24
HETEROTIS	R	0.206	0.027	0.82	0.23	0.14	0.12	0.18
	B	0.018	0.007	0.23	0.12	0.21	0.14	0.12
CHRYSICHTYS	R	0.271	0.131	0.14	0.12	0.16	0.14	1.20
	B	0.020	0.011	0.47	0.80	0.11	0.48	0.23
OREOCHROMIS	R	0.246	0.081	0.20	0.21	0.48	0.40	1.90
	B	0.057	0.011	0.52	0.11	0.13	1.32	0.44
CHANA OBSCURA	R	0.300	0.140	0.15	0.17	0.42	0.23	0.15
	B	0.045	0.011	0.11	0.06	0.15	0.42	0.48
DAGETICHTYS	R	0.300	0.359	0.18	0.34	0.46	0.12	0.16
	B	0.066	0.091	0.48	0.08	0.14	0.46	0.62

Table 3: Comparison of present and previous result recorded on growth strenght (R^2) and slop (B) of fish species

NAME OF FISH SPECIES	OLUGBO =N=	OGOIN =N=
HETEROBRANCHUS	32,000	40,000
CITHARINUS	24,000	30,000
GYMNACHUS	27,000	26,000
SCHILBE	18,000	30,000
SYNODONTIS	24,000	30,000
ALESTES	27,000	37,000
CLARIAS	32,000	39,000
HETEROTIS	23,000	27,000
CHRYSICHTYS	22,000	34,000
OREOCHROMIS	23,000	31,000
CHANA OBSCURA	14,000	32,000
DAGETICHTYS	5000	22,000

Table 4: Summary of cost analysis of all the fish species caught during the survey from the two creeks

In fish analysis, regression analysis was computed using excel soft ware to show growth rate and cost difference between fish species and between creeks. Results showed that for all the fish species caught and identified, co-efficient of determination was weak and all had negative allometric growth rate, similar results were obtained by Anton (2004), ikomi (2005), Ezekiel (2011) and julins (2016). fish species cost analysis was also carried with the aid of graph using excel which showed that in all fish species caught and identified the cost of gymnachus species higher in Olugbobiri creek than Ogboinbiri creek, every other fish species cost higher in Ogbobiri creek than Olugbobiri creek shown in (table 3)

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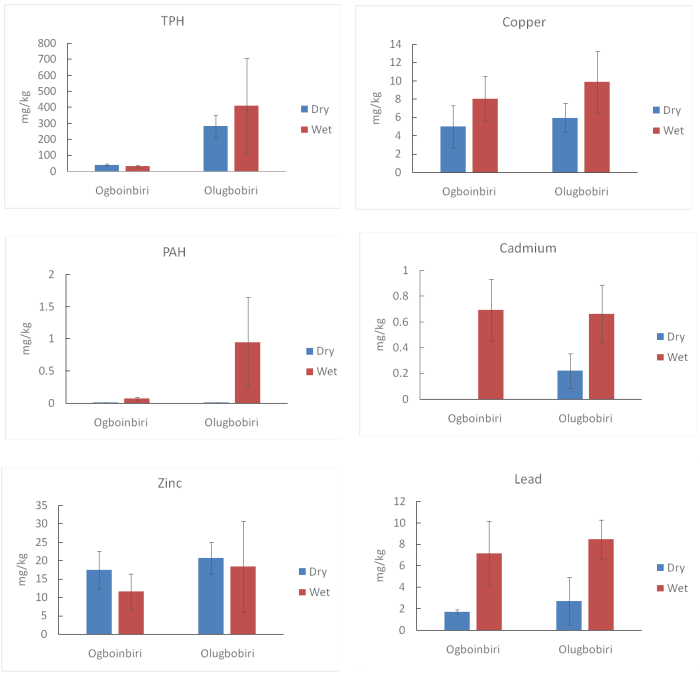

Figure 2

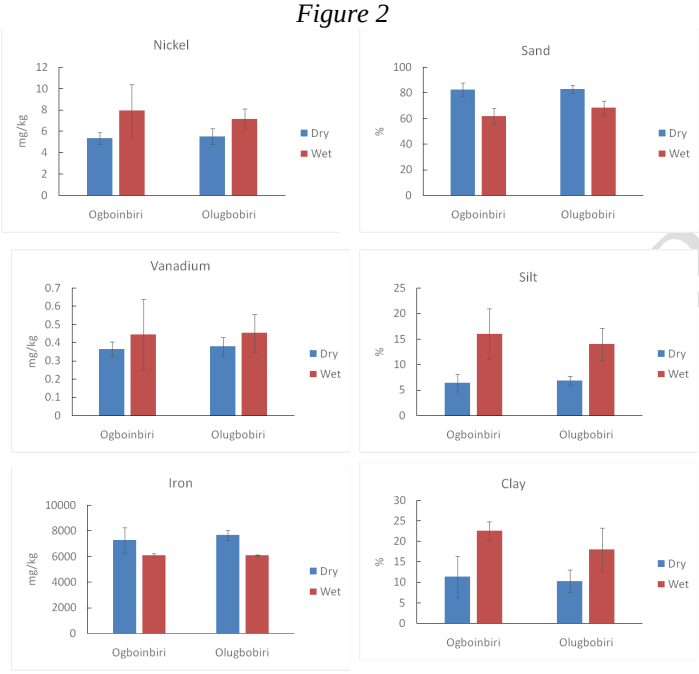

Figure 3

SUMMARY OF FISH COST ANALYS IS DURING THE STUDY PERIOD ?

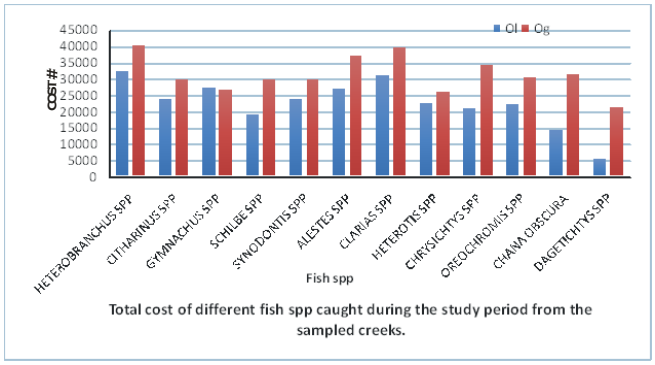

Figure 4

IV. CONCLUSION

Artisanal refining and pipeline vandalization contributed to sediment contamination in Olugbobiri and Ogboinbiri creeks. The main pollutant in the two creeks are total petroleum hydrocarbon, polyaromatic hydrocarbon and iron which are attributes of artisanal refining products, corrosion from vandalized pipes and sinked badges. Little is attribute to assorted wastes dumps. The concentration of these pollutants were more in Olugbobiri creek than Ogboinbiri creek. This is as a result of the frequency of generation, Sediment characteristic in both creeks were observed to be closely related, was of the order sand> clay>silt. TPH mean concentration between dry and raining season was 344.99 and 34.631 while PAH had 0.829 mg/kg and 0.039 hg/kg, iron had 6,855 and 6,667 in Olugbobiri and Ogboinbiri creek respectively. The mean values between dry and raining season showed that Olugbobiri creek sediment is more contaminated than Ogboinbiri creek sediment. The fish species growth rate analysis has no much difference but the fish cost analysis showed, all fish species costed higher in ogboinbiri than Olugbobiri except gymnachus species. Indicating that fisher folks of Ogboinbiri earns a higher income than olugbobiri fisher folks during the study period.

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